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A Conceptual Framework for Understanding Latent Demand: Accounting for Unrealized Activities and Travel

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CONCEPTUAL FRAMEWORK FOR UNDERSTANDING LATENT DEMAND

Accounting for Unrealized
Activities & Travel

Kelly J. Clifton

Intro



“Build it and they will come” argues that there is a “pent up” demand that will be activated by transportation improvements.

Most studies of latent & induced demand focus on traveler responses to changes in travel costs.

There has been little discussion of the underlying behavioral foundations of latent demand

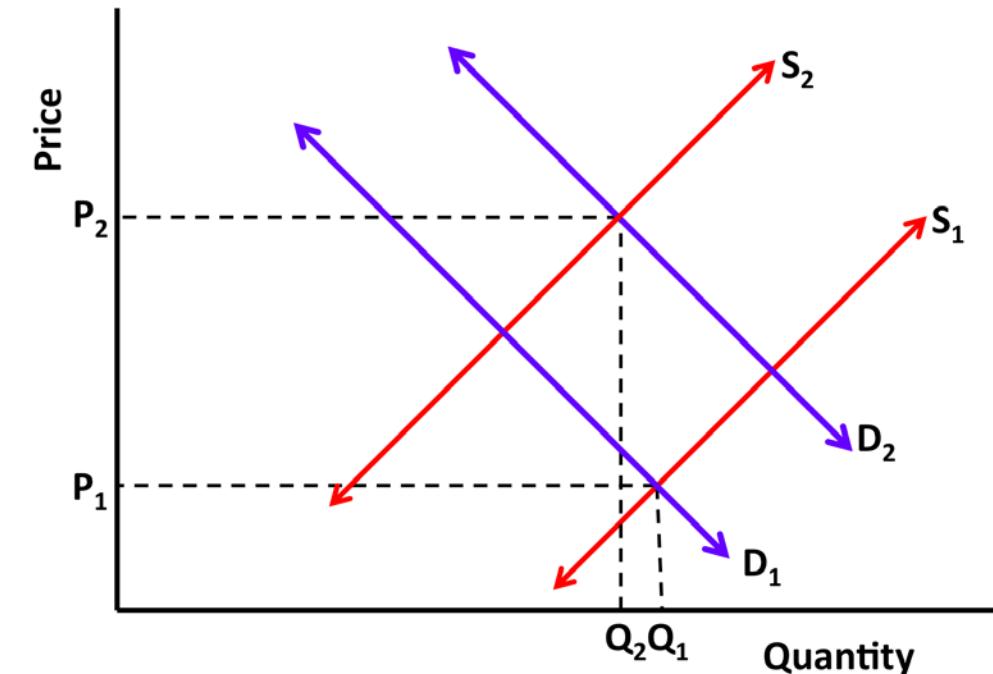
A better definition of latent demand can aid in better forecasting, understand the consequences of unrealized travel, and identify where unmet demand is central to transportation policy.

Demand for transportation

Transport demand is about the movement of people and goods.

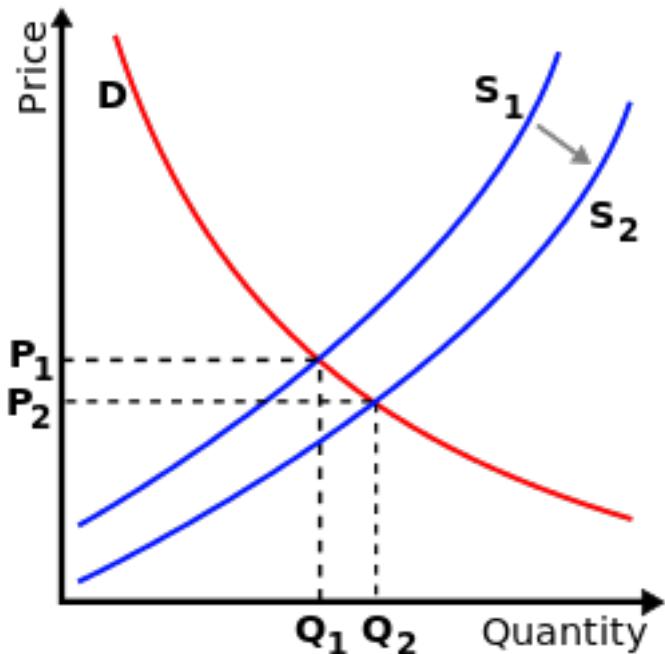
It is considered a ***derived demand***, which refers to demand for one good or service in one sector occurring as a result of demand from another.

Users of transport are primarily consuming the service because they wish to satisfy their needs (e.g. work, shopping, recreation) – or in the case of freight, the demand for goods.



Latent (or Induced) Demand for Travel

Latent demand represents ***currently desired demand*** that is not realized because of a wide variety of constraints.



Redistributed demand represents a ***rearrangement*** in space, time, destination, frequency and/or mode of the previously observed demand due to the relative changes in travel costs.

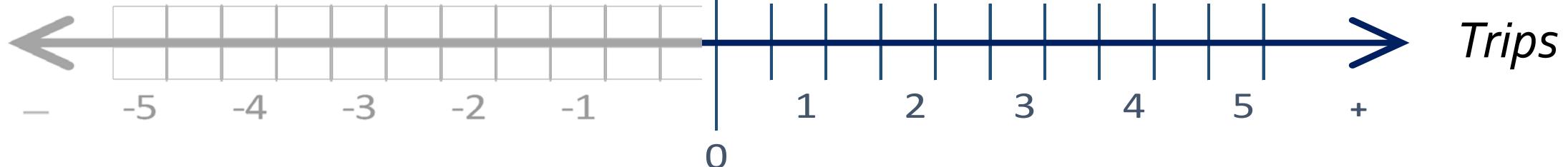
This represents our current approach to forecasting future travel needs – evaluating current demand based upon future predictions of the various explanatory factors.

Generative demand, are previously ***suppressed trips*** that can now be realized, presumably due to changes in the transportation system but perhaps due to exogenous social, economic, cultural and technological drivers.

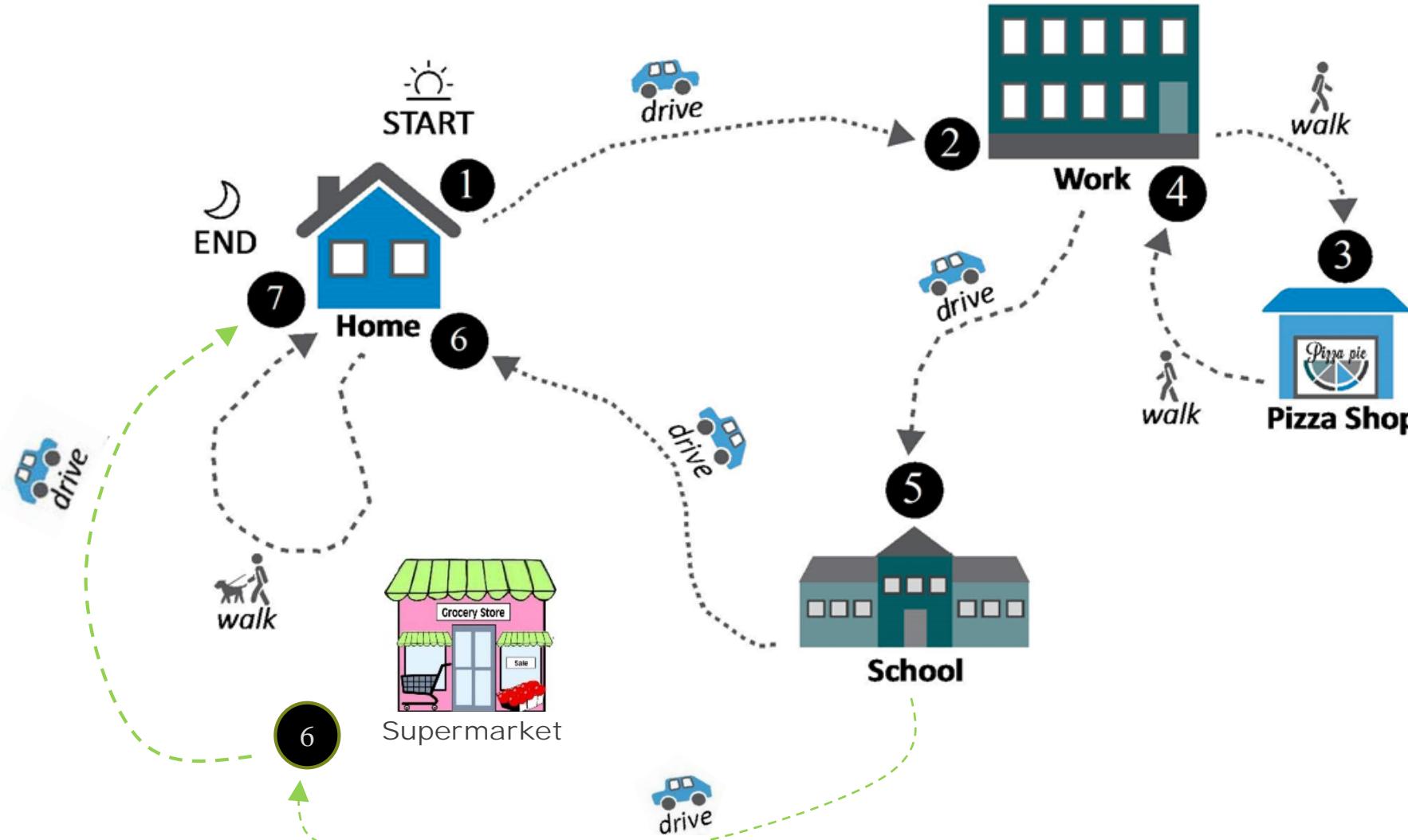
Demand models
are estimated
using data on
observed trips

What about
unmade trips?

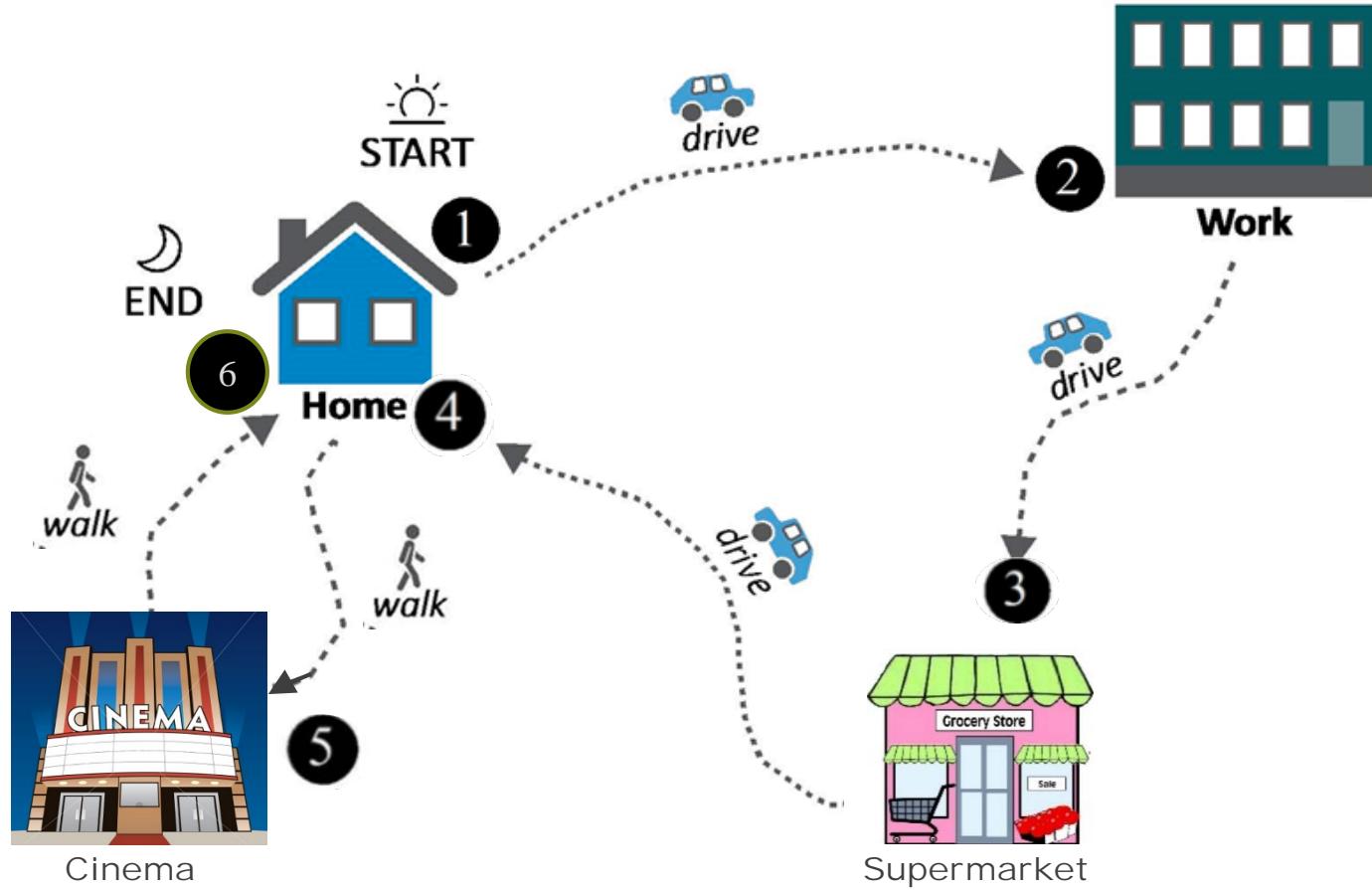
1 Where did you go?	2 How did you get there?	3 What did you do?		
START HERE				
Place 1: Where were you at 4:00 AM on your assigned travel day? Provide place name and address/intersection: <i>Home</i>	What time did you arrive at this place? <input type="checkbox"/> 7 : 3 1 <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM <input type="checkbox"/> Did not leave	How did you get to this place? (for example, walk, car, bus, train, etc.) <i>Drove my car</i>	How many people went with you to this place? <i>0</i>	What time did you leave this place? <input type="checkbox"/> 1 2 : 4 5 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/> Did not leave
Place 2: Where did you go next? Provide place name and address/intersection: <i>Work – Arbor Law Firm 990 Central Ave, Chicago, IL 60639</i>	<input type="checkbox"/> 7 : 5 4 <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM			01. Ate breakfast and got ready for work
Place 3: Where did you go next? Provide place name and address/intersection: <i>Gustoso's Pizza 1800 Kerry Lane, Chicago, IL 60639</i>	<input type="checkbox"/> 1 2 : 5 8 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM	<i>Walked</i>	<i>2</i>	03. Work
Place 4: Where did you go next? Provide place name and address/intersection: <i>Work – Arbor Law Firm 990 Central Ave, Chicago, IL 60639</i>	<input type="checkbox"/> 2 : 0 2 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM	<i>Walked</i>	<i>2</i>	13. Buy and eat lunch
Place 5: Where did you go next? Provide place name and address/intersection: <i>Fairview Elementary 7590 North Rd. Chicago IL 60639</i>	<input type="checkbox"/> 5 : 0 8 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM	<i>Drove my car</i>	<i>0</i>	03. Work
Place 6: Where did you go next? Provide place name and address/intersection: <i></i>	<input type="checkbox"/> 5 : 3 0 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/> Did not leave	<i>Drove my</i>	<i>-</i>	06. Pick up daughter from school
				01. Ate dinner and relaxed



One Travel Day Planned



Next Travel Day Planned



Rationale for this work

What?

Explore the idea of latent demand through the lens of unmet activities and ultimately travel

Why?

A better definition and quantification of this idea can help to:

- better predict the impact of transportation investments,
- Anticipate response to social, technological, cultural and economic change
- help identify inequities,
- understand the consequences of these unmet demands and
- determine to what degree this unmet demand is a matter for transportation policy.

How?

Develop a theoretical framework & approach to data collection

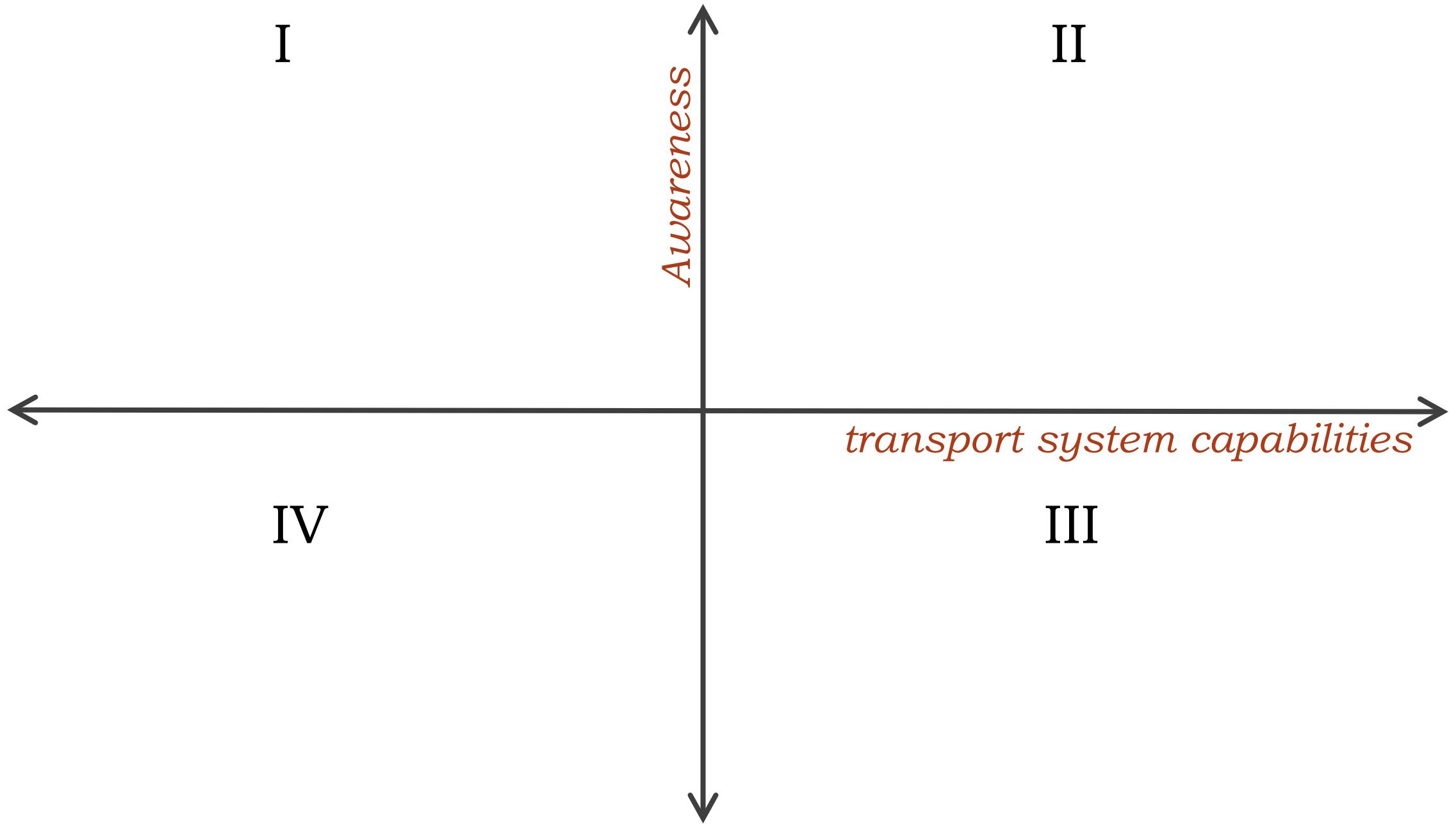
Other Definitions of Latent Demand

Induced demand, or latent demand, is the phenomenon that after supply increases, more of a good is consumed. –Wikipedia

Demand for a product or service that a consumer cannot satisfy because they do not have enough money, because the product or service is not available, or because they do not know that it is available. – Cambridge Dictionary

Latent demand is basically the desire for a product that a consumer is unable to satisfy because he is himself unable to point it out or doesn't realize what is missing until pointed out. –MBASkool

“In contrast to definitions of expressed demand based upon observable buying behavior, the concept of latent demand pertains to those with an interest in participation or “purchase”; who have not translated that interest into action.”
Richardson & Crompton



I

- Activities are desired
- Transport system cannot accommodate

II

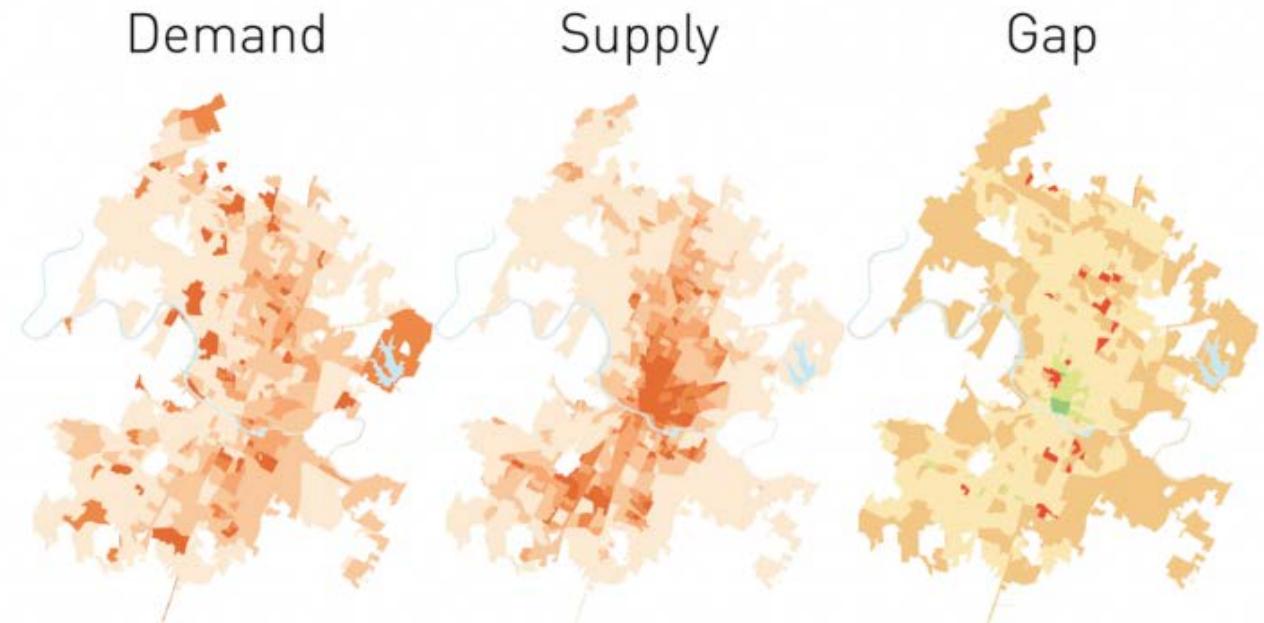


IV

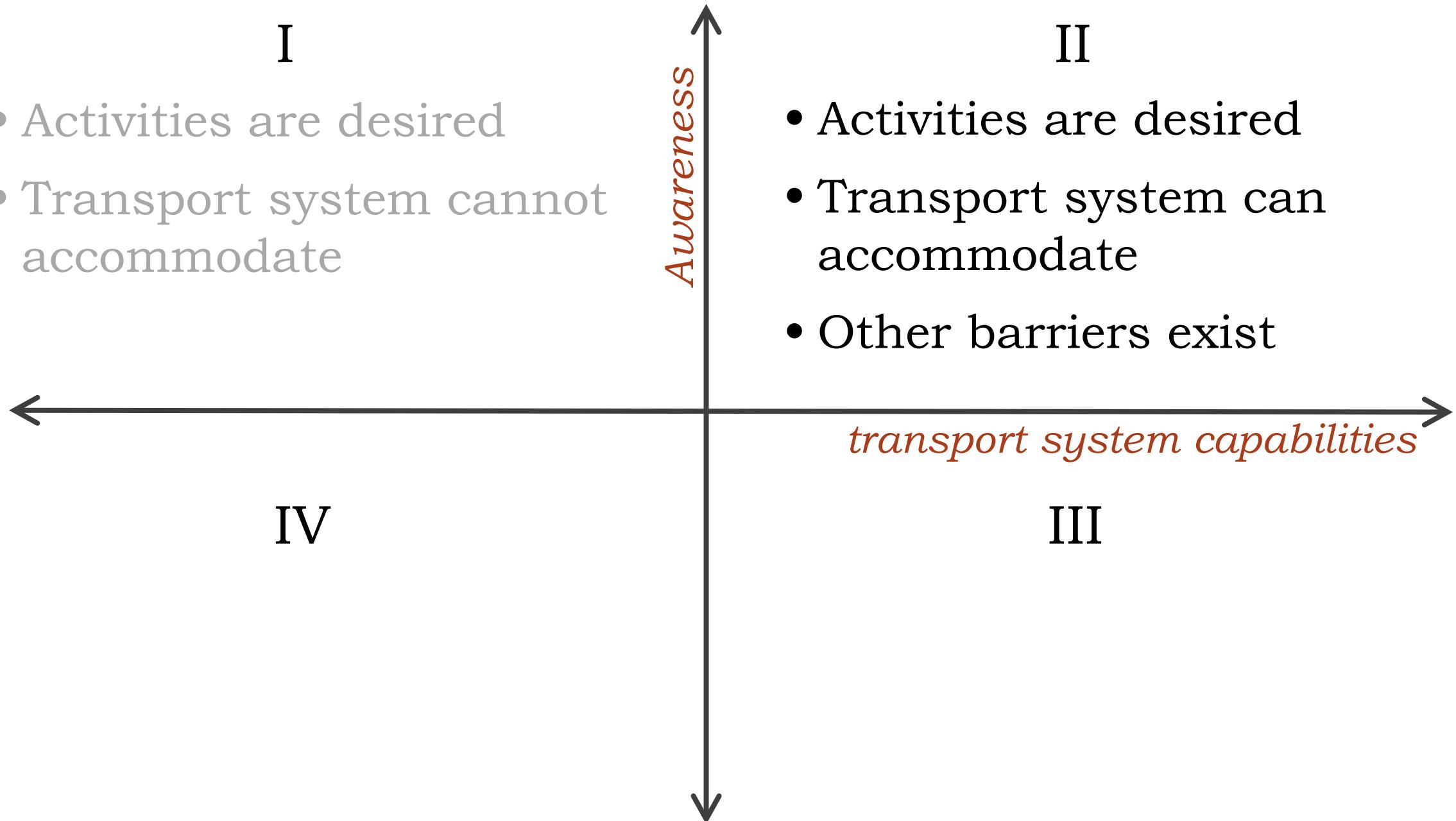
III

I. Examples

- Spatial or temporal gaps in transit service
- Travel times lead to time poverty
- No access to automobiles
- No internet access
- Food deserts
- No sidewalk infrastructure
- Lack of bicycle network connectivity



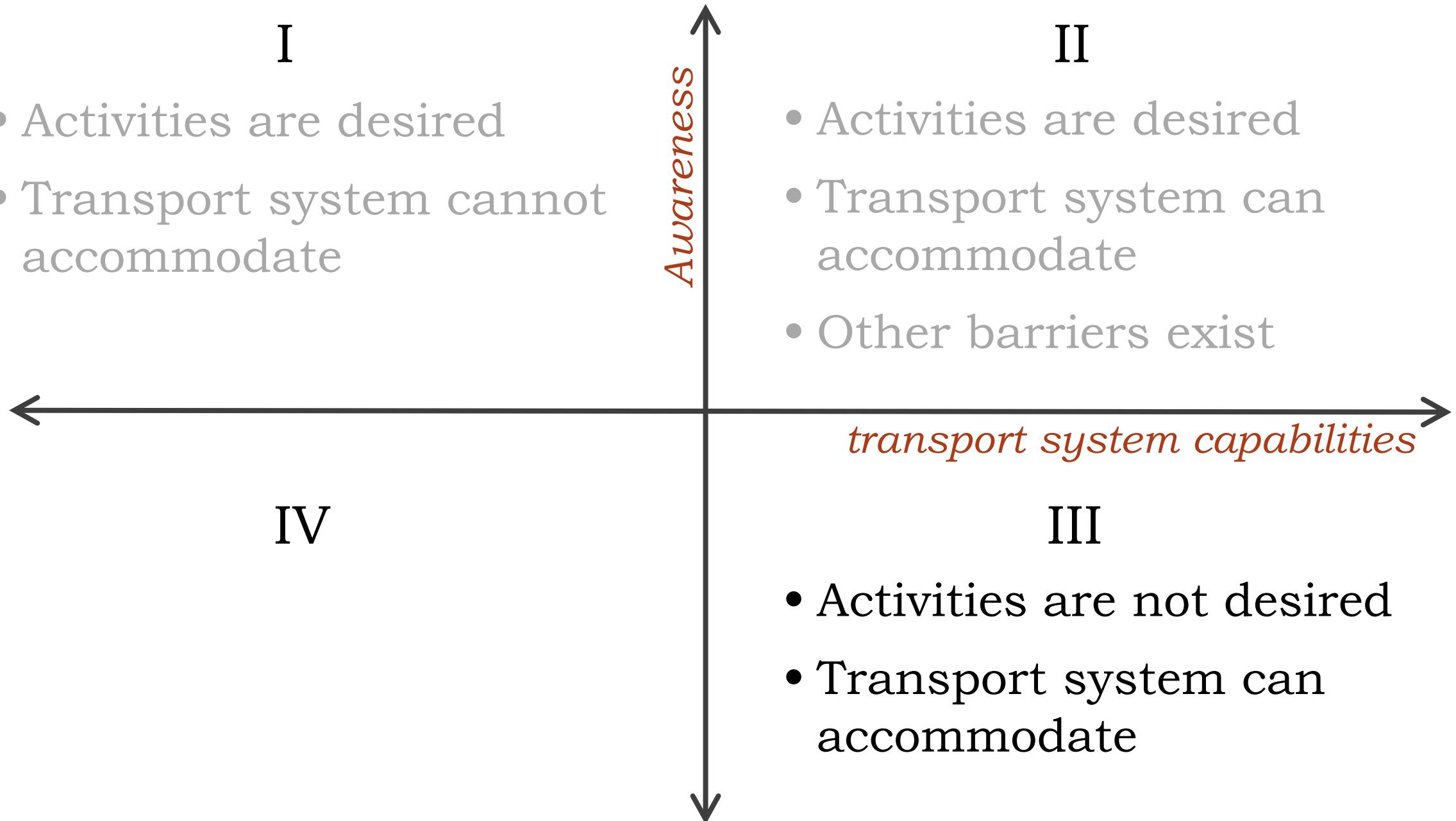
Junfeng Jiao and Aaron Nichols (2015) Identifying Transit Deserts in Texas Cities: The Gap Between Supply and Demand. University of Texas at Austin, Center for Sustainable Development, Working paper series



II. Examples

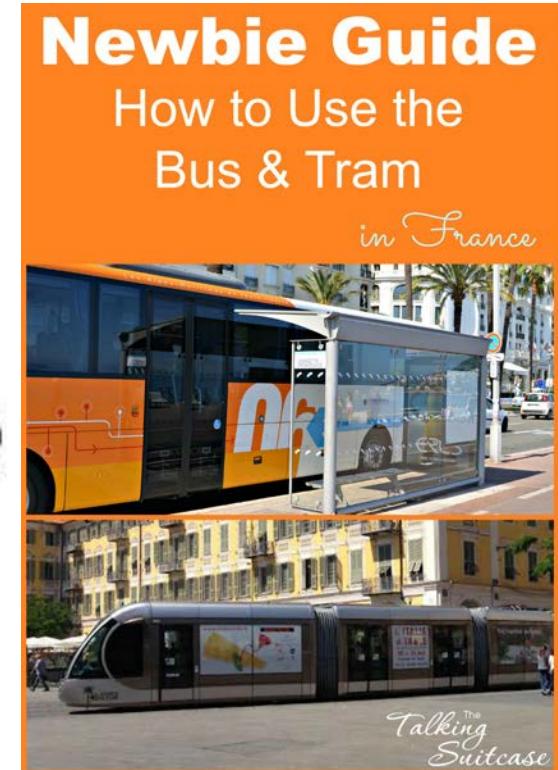
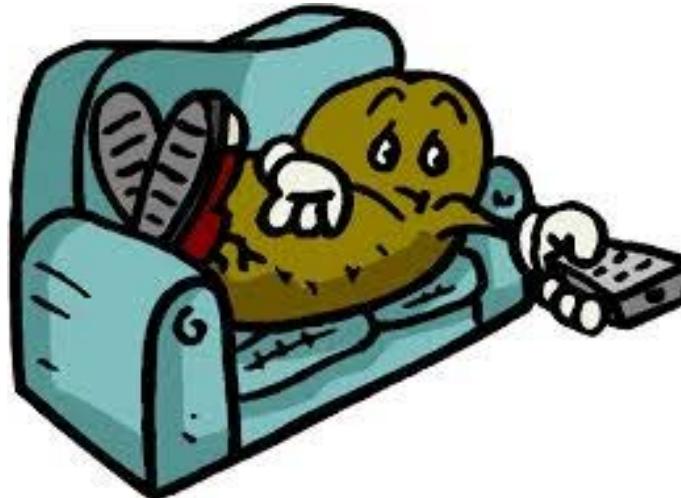
- Poverty
- Activity schedule leads to time poverty (too busy)
- Scheduling conflicts
- Social exclusion
- Cultural barriers
- Lack of work experience or education
- Discrimination
- Housing costs limit choices

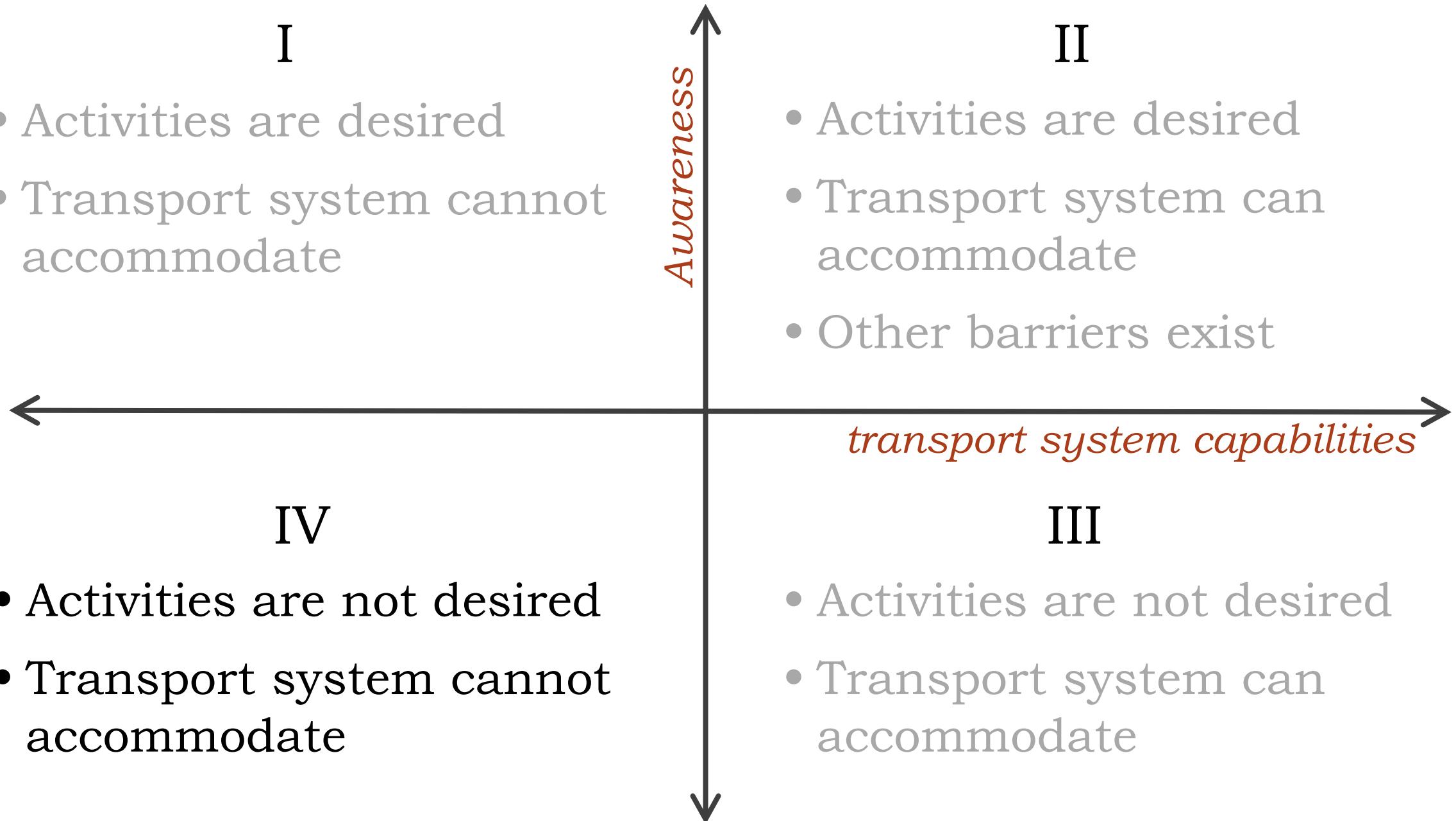




III. Examples

- Mode exists but unaware of how to use it or where it goes
- Not (currently) motivated to engage in an activity
- Yet untried activity: Who knew I would love Stand Up Paddle Boarding?
- Unaware of new restaurant opening
- Surprise visit from a friend taking you to lunch





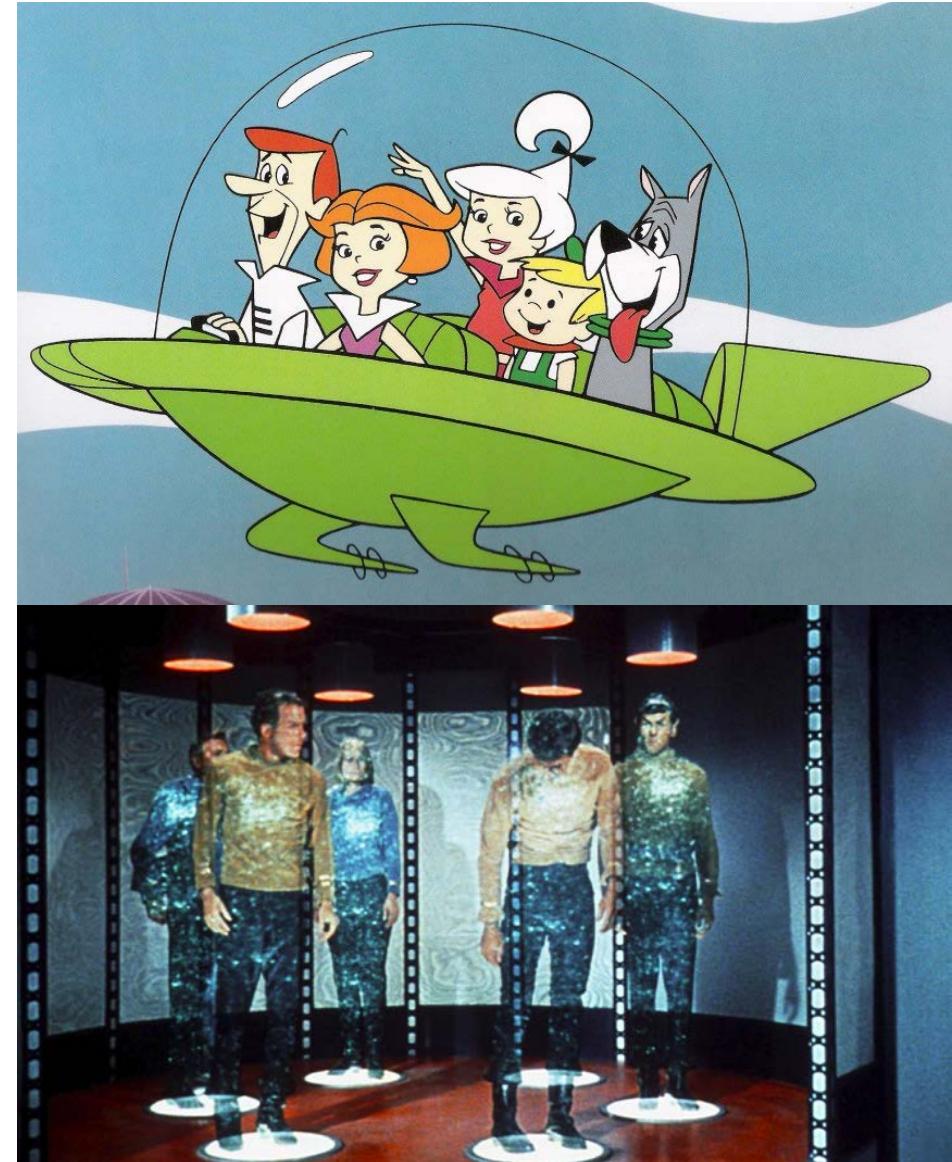
IV. Examples

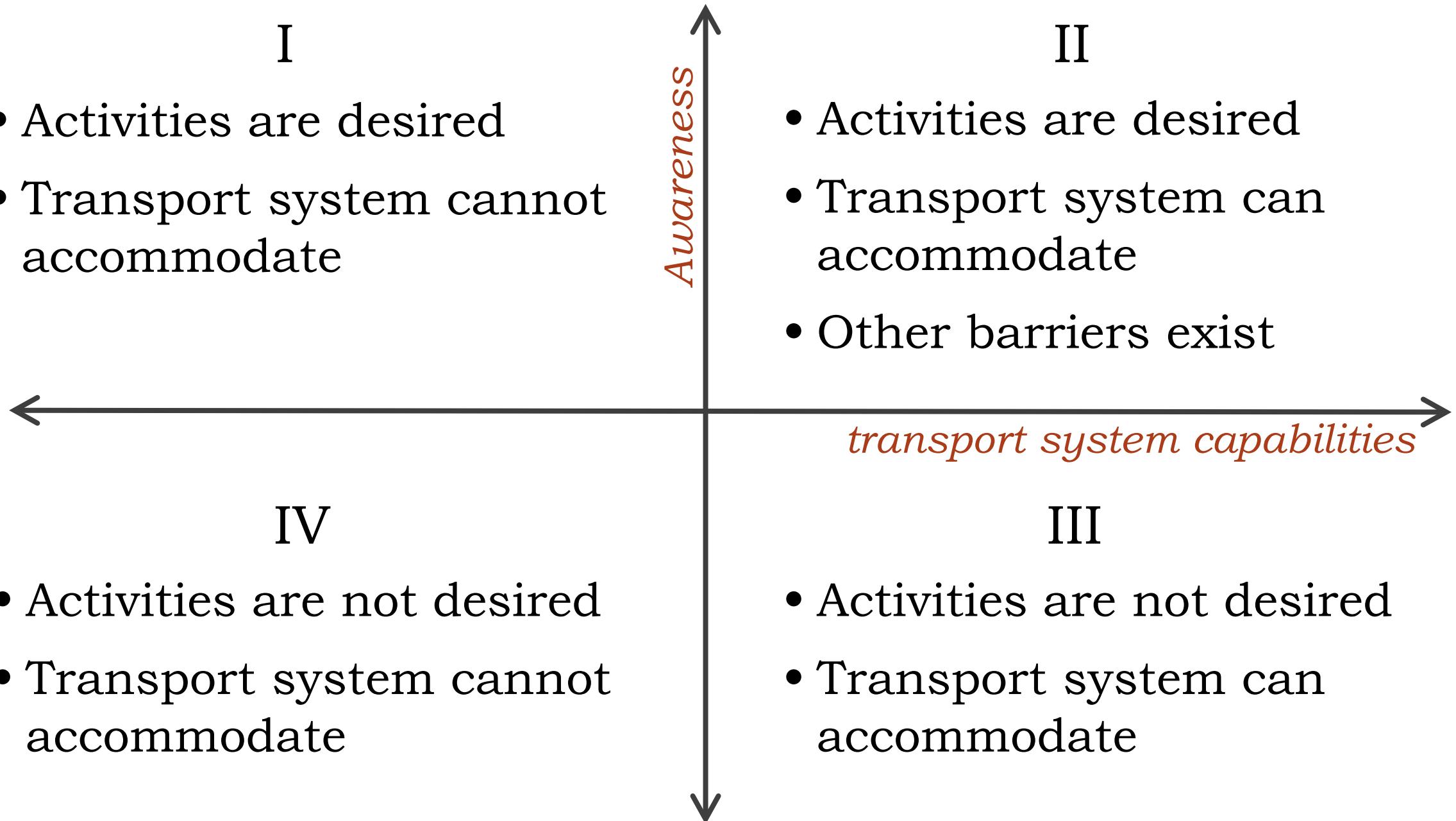
Future modes:

- Driverless vehicles
- Teleportation
- Hovercraft
- SpaceX Hyperloop
- Drone delivery
- 3-D Printing
- Etc.

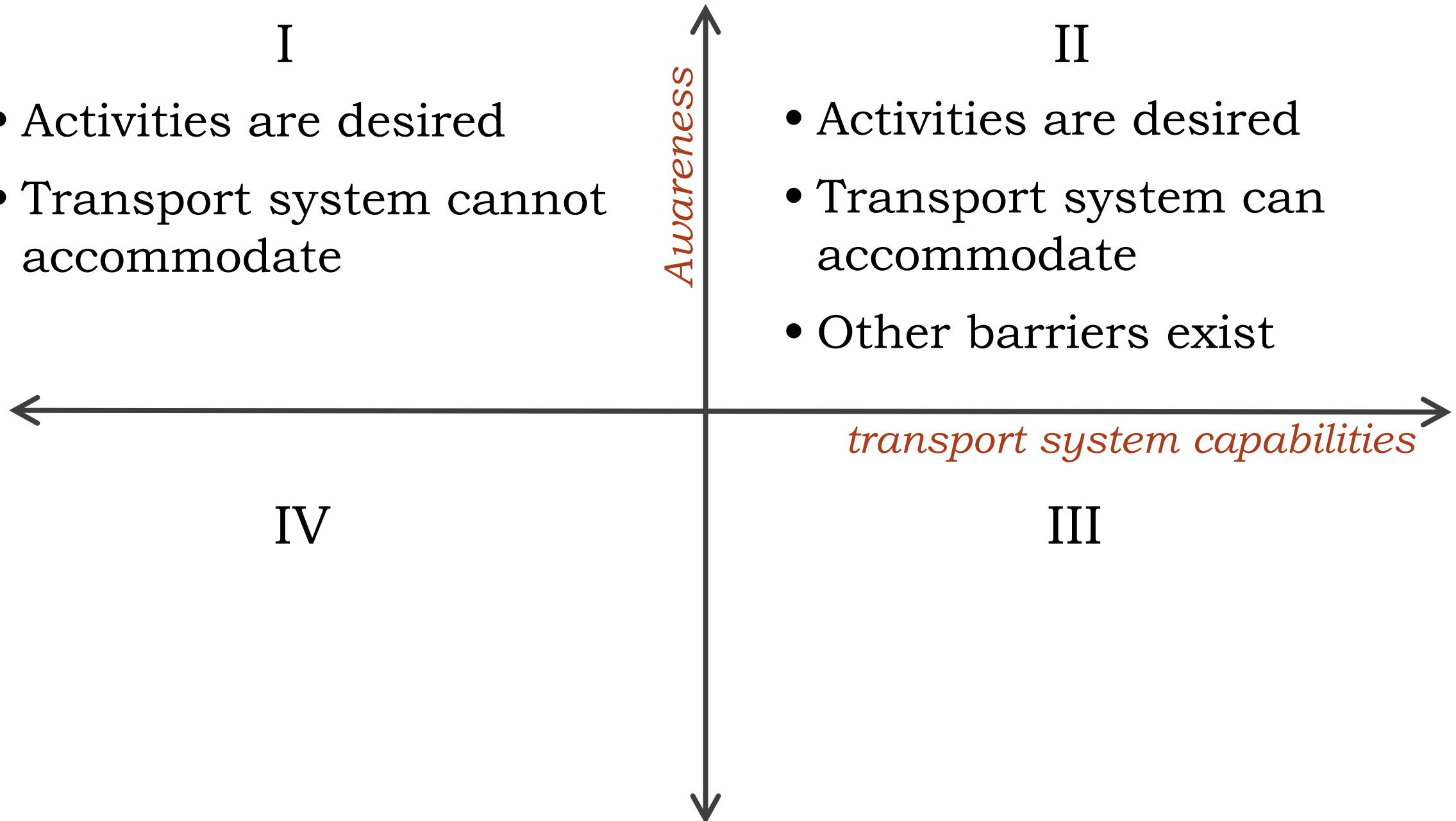
Previously (say in 1980):

- Online shopping
- Uber
- Smart phones
- Etc.

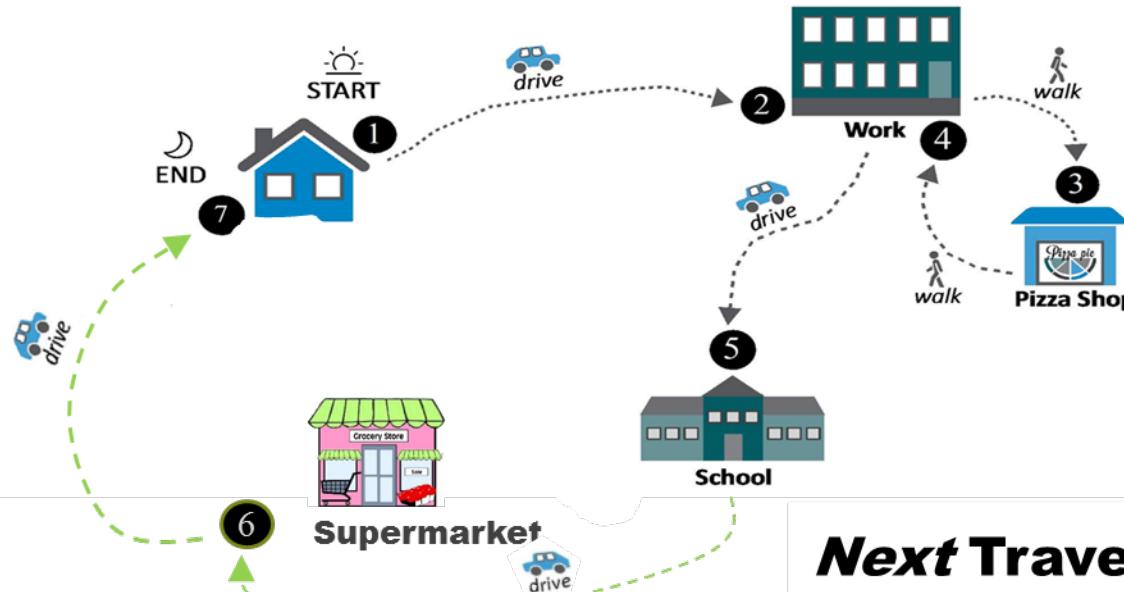




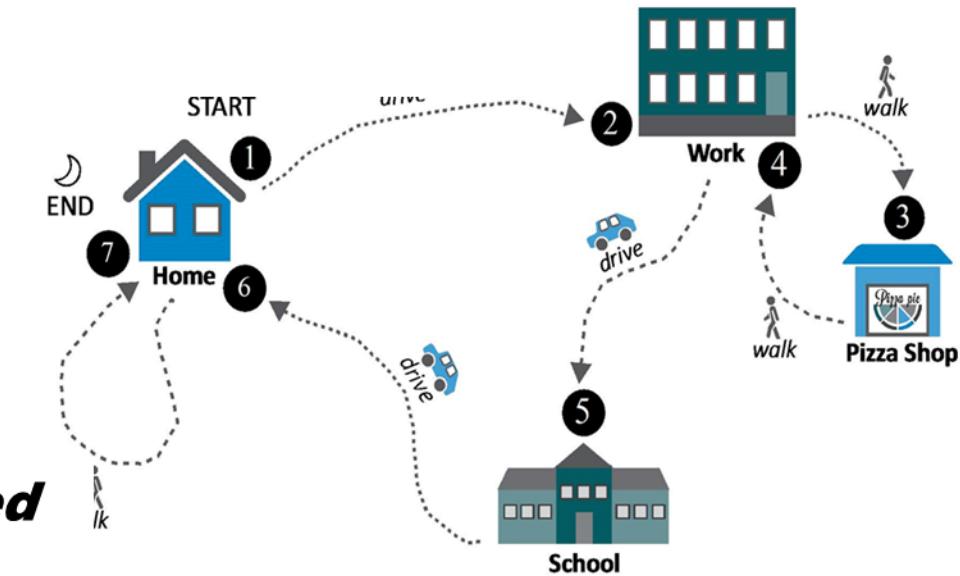
How might we capture these various
types of latent demand?



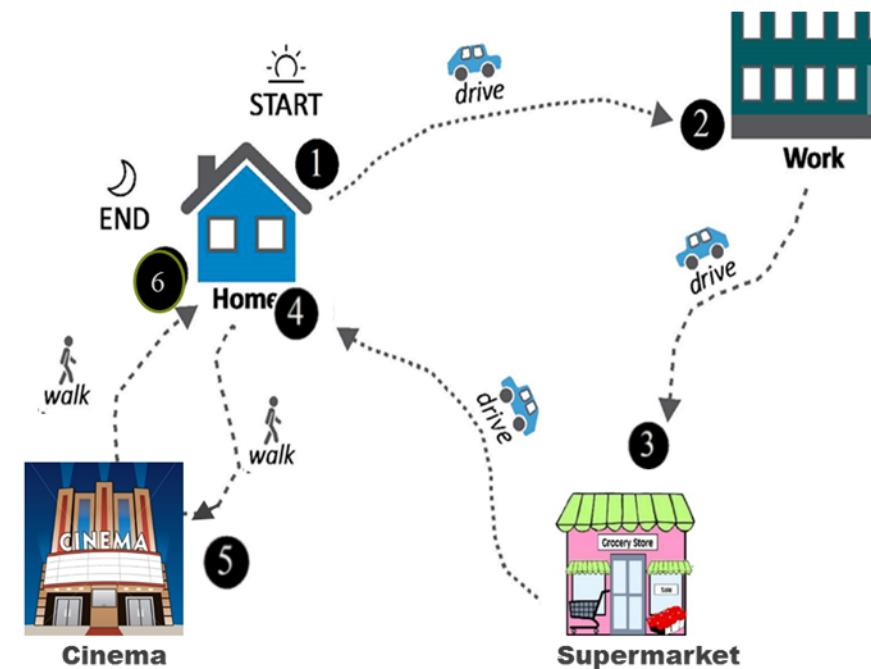
One Travel Day Planned



One Travel Day Observed



Next Travel Day Planned



Activity, travel, attitudes, & preferences (multi-day)

1 Where did you go?	2 How did you get there?	3 What did you do?
START HERE		
Place 1: Where were you at 4:00 AM on your assigned travel day? Provide place name and address/intersection: <i>Home</i>		
Place 2: Where did you go next? Provide place name and address/intersection: <i>Work - Arbor Law Firm 990 Central Ave, Chicago, IL 60639</i>		
Place 3: Where did you go next? Provide place name and address/intersection: <i>Gustoso's Pizza 1800 Kerry Lane, Chicago, IL 60639</i>		
Place 4: Where did you go next? Provide place name and address/intersection: <i>Work - Arbor Law Firm 990 Central Ave, Chicago, IL 60639</i>		
Place 5: Where did you go next? Provide place name and address/intersection: <i>Fairview Elementary 7590 North Rd, Chicago IL 60639</i>		
Place 6: Where did you go next? Provide place name and address/intersection:		

2 How did you get there?

What time did you arrive at this place?
How did you get to this place? (for example, walk, car, bus, train, etc.)
How many people went with you to this place?

What time did you leave this place?
 7 : 3 1
 AM PM
 Did not leave

7 : 5 4
 AM PM

Drove my car

0

1 2 : 4 5
 AM PM
 Did not leave

1 2 : 5 8
 AM PM

Walked

2

1 : 4 5
 AM PM
 Did not leave

2 : 0 2
 AM PM

Walked

2

4 : 5 2
 AM PM
 Did not leave

5 : 0 8
 AM PM

Drove my car

0

5 : 2 0
 AM PM
 Did not leave

6 : 4 4
 AM PM

Drove my

0

7 : 3 0
 AM PM
 Did not leave

3 What did you do?

What did you do at this place?
Use the Activity List below.

01- Ate breakfast and got ready for work

03- Work

73- Buy and eat lunch

03- Work

06- Pick up daughter from school

01- Ate dinner and relaxed



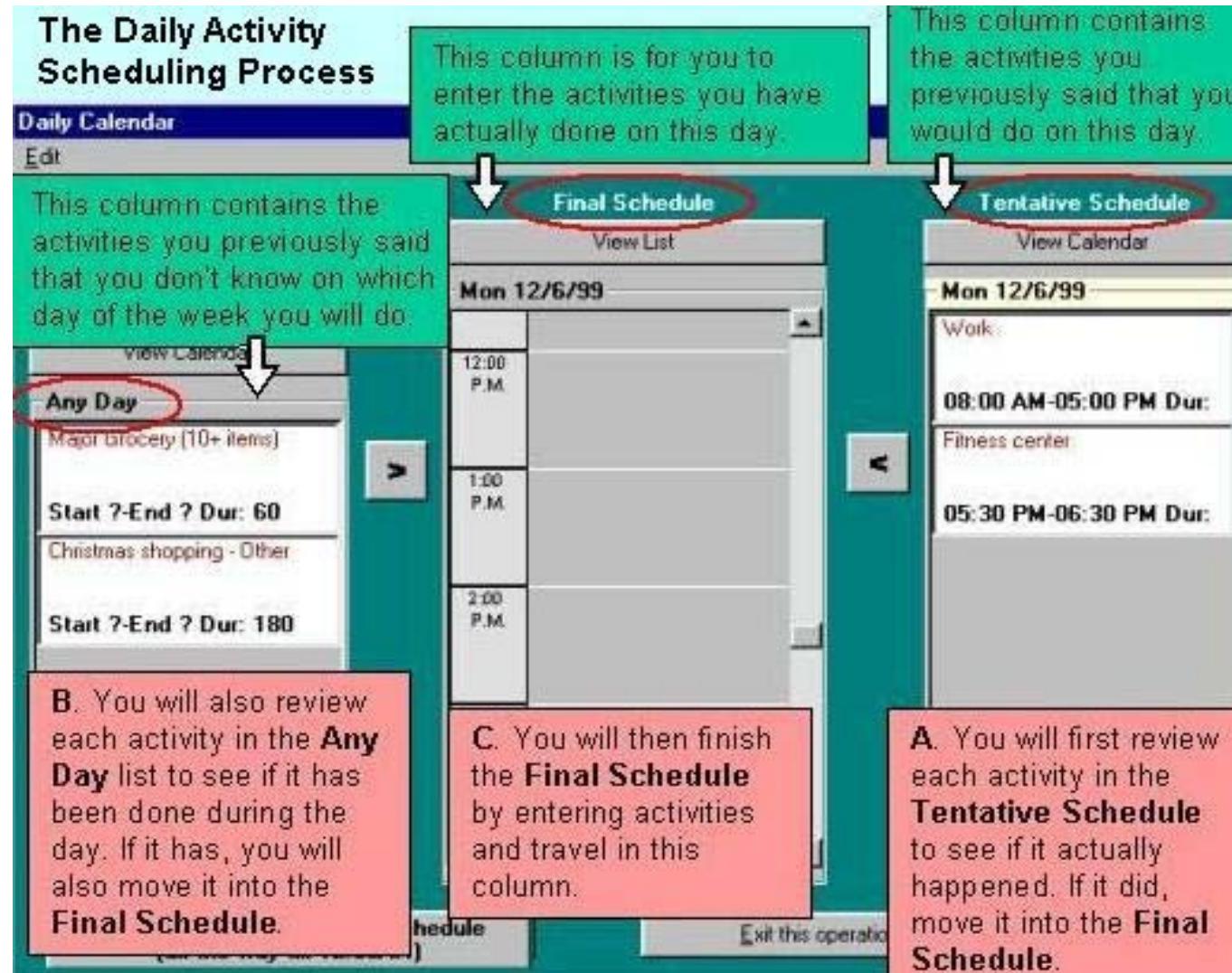
Activity, travel, attitudes, & satisfaction (multi-day)

1 Where did you go?	2 How did you get there?	3 What did you do?
 START HERE Place 1: Where were you at 4:00 AM on your assigned travel day? Provide place name and address/intersection: <i>Home</i>	What time did you arrive at this place? How did you get to this place? (for example, walk, car, bus, train, etc.) How many people went with you to this place? <input type="checkbox"/> 7 <input type="checkbox"/> 3 <input type="checkbox"/> 1 <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM <input type="checkbox"/> Did not leave	What time did you leave this place? <input type="checkbox"/> 7 <input type="checkbox"/> 3 <input type="checkbox"/> 1 <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM <input type="checkbox"/> Did not leave
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Place 3: Where did you go next? Provide place name and address/intersection: <i>Gusbozo's Pizza 1800 Kerry Lane, Chicago, IL 60639</i>	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 5 <input checked="" type="checkbox"/> 8 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM Walked 2	<input type="checkbox"/> 1 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/> Did not leave
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Place 6: Where did you go next? Provide place name and address/intersection:	<input type="checkbox"/> 7 <input type="checkbox"/> 3 <input type="checkbox"/> 0	What did you do at this place? Use the Activity List below.
		01- Ate breakfast and got ready for work 03- Work 13- Buy and eat lunch 03- Work 06- Pick up daughter from school 01- Ate dinner



But not enough for unmade trips & unrealized activities





McNally, MG and Lee, MS (2002). *Putting Behavior in Household Travel Behavior Data: An Interactive GIS-based Survey Via the Internet*, Final Report to the University of California Transportation Center, Berkeley, CA.

Activity Scheduling Process

Work in the early 2000s

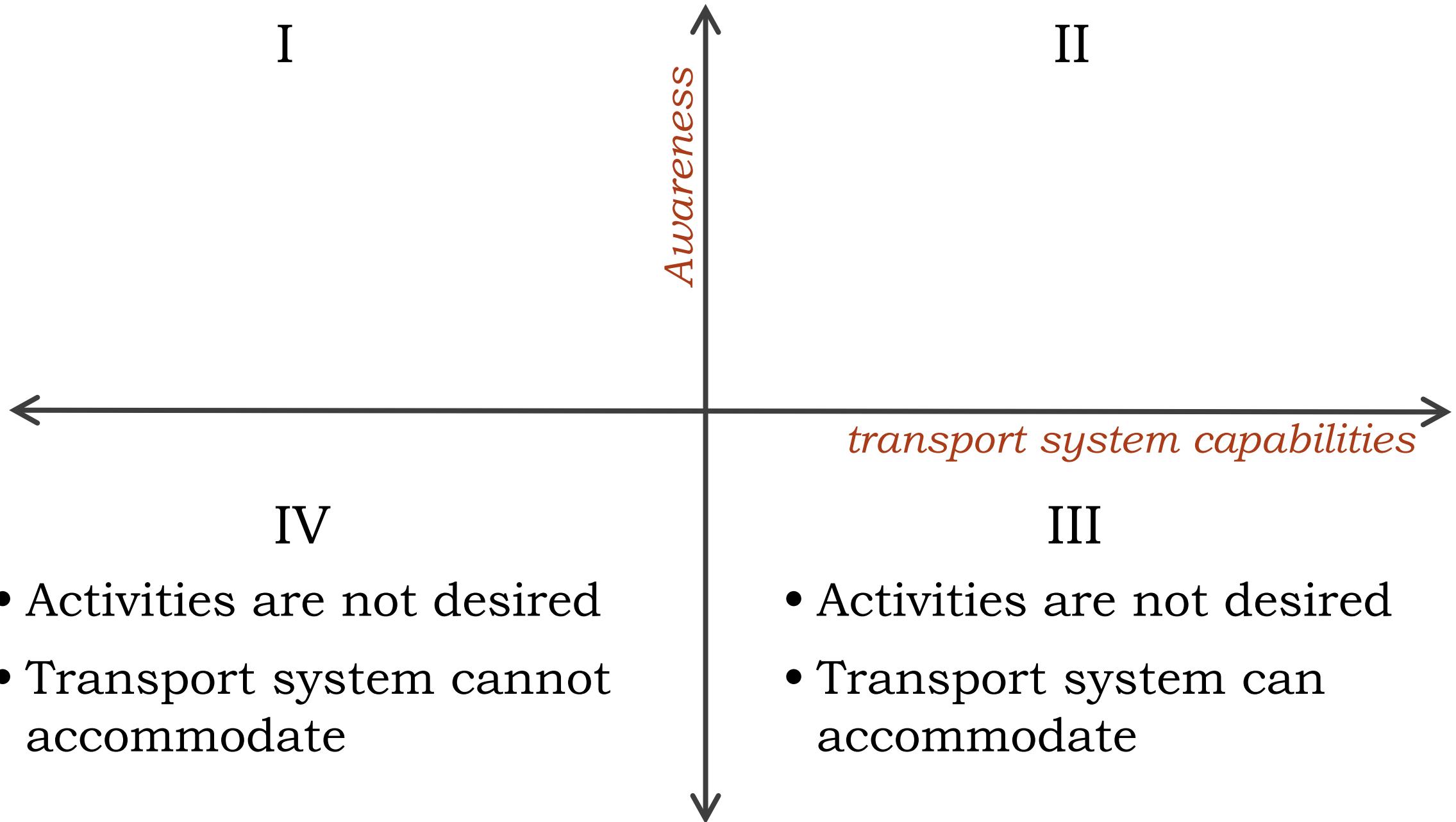
Computer aided survey

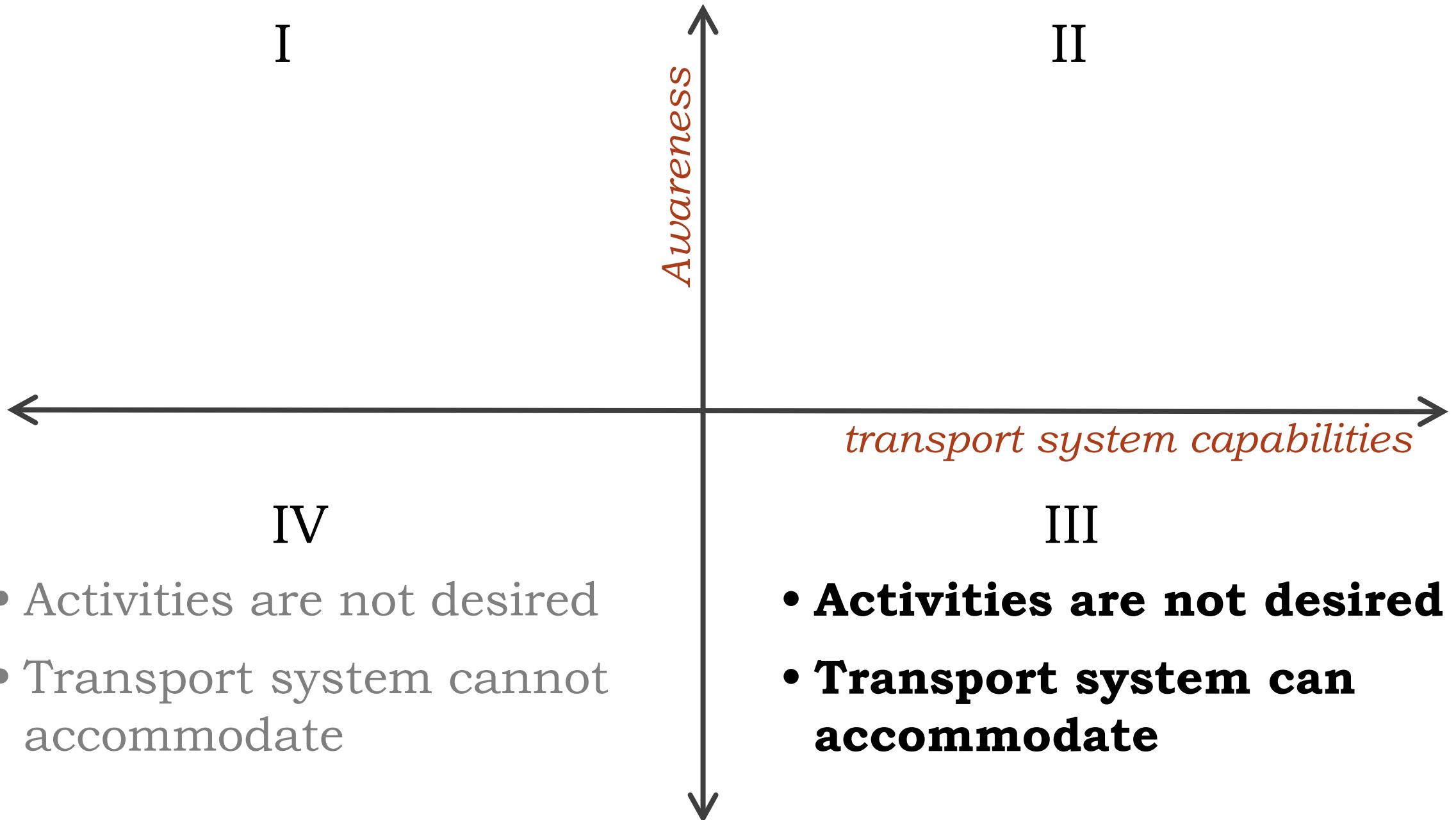
Collect information on the planning process:

- What you plan to do?
- When you plan to do it?
- What you actually did?
- How did it work out for you?

Large respondent burden

Could be revisited with smart phone technology





Behavioral change

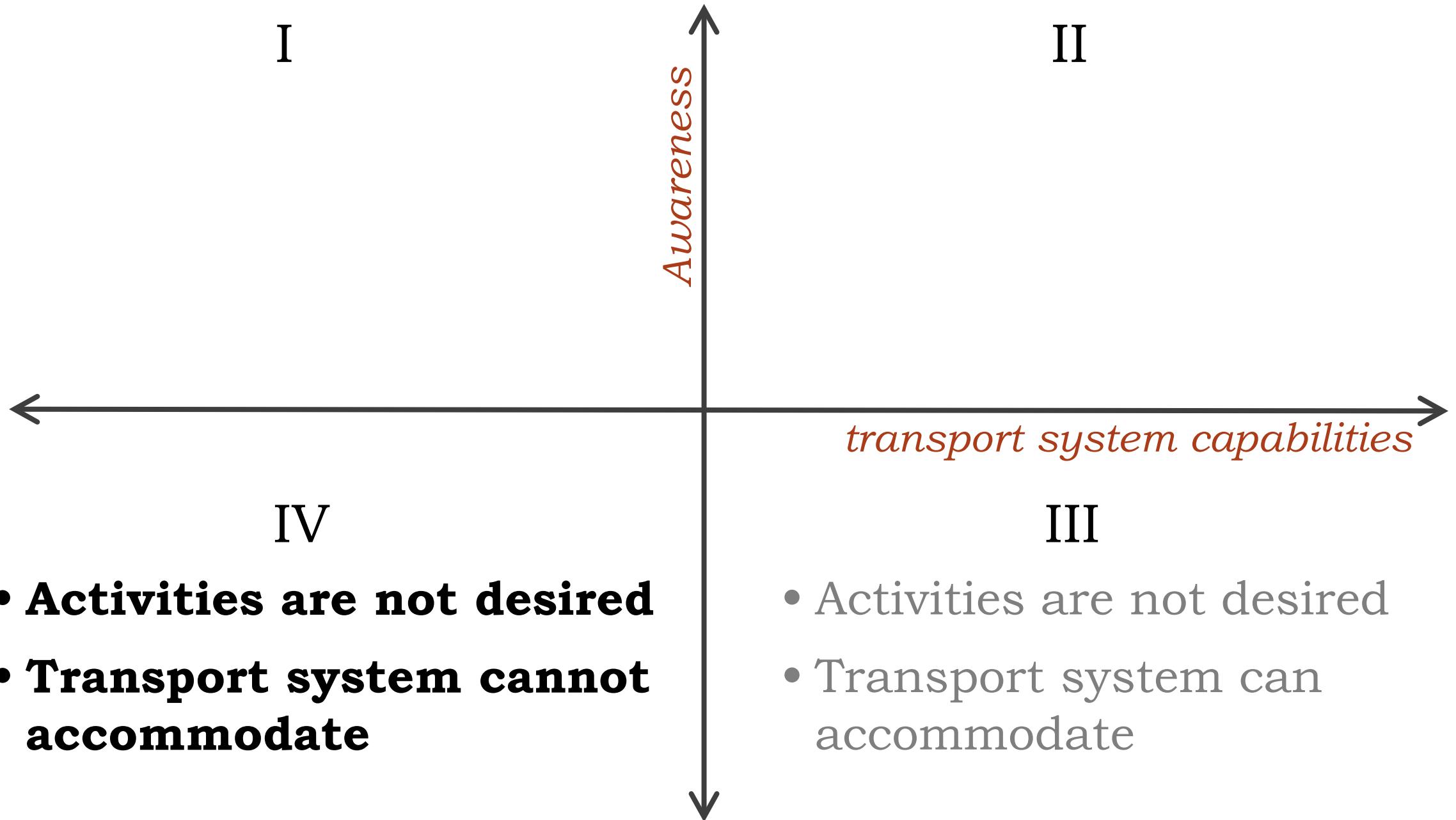
If the public is not aware of existing options or not motivated to use them, programs can work to address the gaps

Drawing upon research in health disciplines:

- Education/Awareness
- Information
- Motivation
- Support

Public campaigns to reduce driving, learn how to use transit, ride a bike, encourage walking.





Stated Preference Surveys

Option A

Cost: \$2.50

Travel time: 30 minutes

Share ride with others



Option B

Cost: \$12

Travel time: 20 minutes

Have vehicle to yourself



What are the drivers of the demand for activities & travel?

- What motivates us?
- Psychology & other behavioral disciplines have a lot to offer
- Might be important to understand how we might respond to new opportunities in the future
- Marketing discipline has made use of this research
- They induce demand for products
- What can we learn here?



Maslow, A. H. (1943). A Theory of Human Motivation. *Psychological Review*, 50(4), 370-96.

Hypothetical ↑

↓ Constraints

6. Unimagined Activities

5. Dreams, Desires Possibilities

4. Aspirations & Intentions

3. Tentative Planned
Activities & Travel

2. Scheduled Activity &
Travel Agenda

1. Realized Activity &
Travel Pattern

Conclusions

Our current theories, data collection, and methods are inadequate.

We need a more theoretically-sound definition of demand.

Theoretical exploration of the origins of activity demand from multiple disciplines could enrich and improve our efforts to plan for the future.

Understand unmet needs and how transportation policies, other programs and innovations may address demand.



QUESTIONS?

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